Preliminary Findings of National Marine Fisheries Service's (NMFS) Critical Habitat Development and Review Teams for Seven Salmon and O. mykiss Evolutionarily Significant Units (ESUs) in California

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Executive summary

The National Marine Fisheries Service (NMFS) has conducted a series of comprehensive reviews of the status of west coast populations of Pacific salmon and steelhead (*Onchorhynchus* spp.) over the past ten years pursuant to the U.S. Endangered Species Act (ESA). These reviews have identified numerous distinct population segments, referred to as evolutionarily significant units (ESUs), that warrant listing as threatened or endangered species under the ESA. Status review updates were most recently completed in 2003 (NMFS 2003) and revised listing determinations were proposed on June 14, 2004 (69 FR 33102). As of February 2000, NMFS had designated critical habitat for all listed salmon and steelhead ESUs; however, as a result of subsequent litigation the designations for 19 ESUs, including 6 in California, were vacated by court order in 2002 and remanded back to NMFS to propose new critical habitat designations.

The ESA defines critical habitat as those specific areas within the geographic area occupied by the species, at the time of listing, containing physical and biological features essential to the conservation of the species that may require special management considerations; and occupied areas that are essential to the conservation of the species. By statute, ESA critical habitat designations must be based on the best scientific data available to the agency. Per section 4(b)(2) of the ESA, the agency must also consider economic impacts, impacts to national security, and other relevant impacts of designating any particular areas as critical habitat. The section of the ESA grants the Secretary of Commerce discretion to exclude any area from critical habitat if he determines that the benefits of exclusion outweigh the benefits of specifying such an area as part of the critical habitat. This discretion is limited, as the agency may not exclude areas that if excluded would result in the extinction of the species.

This report provides background information on the critical habitat designation process under the ESA and an overview of the agency's approach for developing geographical distribution maps and preliminary conservation assessments for seven salmon and *O. mykiss* ESUs in California including: California Coastal (CC) chinook, Northern California (NC) *O. mykiss*, Central California coast (CCC) *O. mykiss*, South-Central California coast (SCCC) *O. mykiss*, Southern California (SC) *O. mykiss*, Central Valley (CV) spring run chinook, and Central Valley (CV) *O. mykiss*. For each ESU, information on areas of occupancy, habitat use (i.e. spawning, rearing, and migration), and habitat quality was compiled by NMFS Southwest Region biologists from a variety of sources and agencies, including the literature, agency records, and personal knowledge. The agency then incorporated this information into a geographical information system (GIS) and produced GIS maps showing the stream reaches occupied by each ESU. Relying on the biology and life history of each species, we also determined the physical or biological features essential for the conservation of each listed ESU. These were identified in an Advance Notice of Proposed Rulemaking (ANPR) published in September 2003 for which public comment was solicited (68 FR 55926). Relying on the biology and population structure of the species, we also identified "specific areas" in which these physical or biological features could be found. The specific areas used by the Southwest Region for ESUs in California were CALWATER Hydrologic Subareas (HSAs). In the Northwest, the agency used U.S. Geological Survey fifth field hydrologic units (HUCs) as specific areas. Within the boundaries of any HSA or HUC, there are both stream reaches and land areas that are not "occupied" by the species. We relied on these watershed boundaries only as a basis for aggregating occupied stream reaches into coherent units for which information was compiled and conservation value assessments could be made.

The Southwest Region established three critical habitat analytical review teams (CHART teams) consisting of agency biologists and habitat specialists from our field offices in Sacramento, Santa Rosa, and Arcata, as well as the Regional office in Long Beach. Their first task was to compile all available information (e.g. distribution, relative abundance, habitat use, habitat quality, etc.) necessary to identify and map the occupied stream reaches for each of the seven listed salmon and *O. mykiss* ESUs under consideration, confirm that each occupied HSA contained the physical or biological features essential to conservation (i.e. spawning, rearing and/or migration habitat was present), and identify the activities in each HSA that may affect the physical or biological features and require special management. Their second task was to assess and rate the conservation value of each occupied HSA as "high," "medium," or "low." To arrive at these ratings they first considered a variety of data sources and employed a generally uniform scoring system based on the quality, quantity, and distribution of physical or biological features associated with spawning, rearing, and migration in each HSA. They next considered each HSA in relation to other HSAs supporting that ESU and in relation to the ESU population(s) occupying that HSA. Using their best professional judgment they rated the conservation value of the watersheds, riverine corridors, and estuarine areas comprising the HSAs which were occupied by each ESU.

The preliminary mapping and conservation findings described in this report are as follows:

<u>CC Chinook ESU</u>. For this ESU, the CHART identified 45 occupied HSAs within the freshwater and estuarine range of the ESU. Eight HSAs were rated low in conservation value, 10 were rated medium, and 27 were rated high in conservation value. Essential features for spawning, rearing, and migration are contained in approximately 1,638 miles (2,621 km) of occupied stream habitat within these HSAs.

<u>NC O. mykiss ESU.</u> For this ESU, the CHART identified 50 occupied HSAs within the freshwater and estuarine range of the ESU. Nine HSAs were rated low in conservation value, 14 were rated medium, and 27 were rated high in conservation value. Essential features for spawning, rearing, and migration are contained in approximately 3,128 miles (5,005 km) of occupied stream habitat within these HSAs.

<u>CCC O. mykiss ESU</u>. For this ESU, the CHART identified 47 occupied HSAs within the freshwater and estuarine range of the ESU. Thirteen HSAs were rated low in conservation value, 13 were rated medium, and 20 were rated high in conservation value. Essential features for spawning, rearing, and migration are contained in approximately 2,002 miles (3,203 km) of occupied stream habitat within these HSAs.

<u>SCCC O. mykiss ESU</u>. For this ESU, the CHART identified 30 occupied HSAs within the freshwater and estuarine range of the ESU. Six HSAs were rated low in conservation value, 11 were rated medium, and 13 were rated high in conservation value. Essential features for spawning, rearing, and migration are contained in approximately 1,261 miles (2,018 km) of occupied stream habitat within these HSAs.

<u>SC O. mykiss ESU</u>. For this ESU, the CHART identified 37 occupied HSAs within the freshwater and estuarine range of the ESU. Six HSAs were rated low in conservation value, 6 were rated medium, and 25 were rated high in conservation value. Essential features for spawning, rearing, and migration are contained in approximately 837 miles (1,339 km) of occupied stream habitat within these HSAs.

<u>CV Spring-run chinook ESU</u>. For this ESU, the CHART identified 37 occupied HSAs within the freshwater and estuarine range of the ESU. Eight HSAs were rated low in conservation value, 4 were rated medium, and 25 were rated high in conservation value. Essential features for spawning, rearing, and migration are contained in approximately 1,381 miles (2,209 km) of occupied stream habitat within these HSAs.

<u>CV O. mykiss ESU</u>. For this ESU, the CHART identified 67 occupied HSAs within the freshwater and estuarine range of the ESU. Fourteen HSAs were rated low in conservation value, 16 were rated medium, and 37 were rated high in conservation value. Essential features for spawning, rearing, and migration are contained in approximately 2,607 miles (4,171 km) of occupied stream habitat within these HSAs.

I. Background

NMFS is responsible for determining whether species, subspecies, or distinct population segments of Pacific salmon and steelhead (*Oncorhynchus* spp.) are threatened or endangered and which areas constitute critical habitat for them under the U.S. ESA (16 U.S.C. 1531 et seq). To be considered for ESA listing, a group of organisms must constitute a "species." Section 3 of ESA defines species as follows: "any subspecies of fish or wildlife or plants, and any distinct population segment of any species of vertebrate fish or wildlife which interbreeds when mature." The agency has determined that a group of Pacific salmon or steelhead populations qualifies as a distinct population segment if it is substantially reproductively isolated and represents an important component in the evolutionary legacy of the biological species. A group of populations meeting these criteria is considered an "evolutionarily significant unit" (ESU) (56 FR 58612, November 20, 1991). Over the past ten years, NMFS has conducted a series of comprehensive reviews of the status of West Coast populations of Pacific salmon and steelhead (*Oncorhynchus* spp.) pursuant to the U.S. Endangered Species Act (ESA) and has listed 26 ESUs as threatened or endangered under the ESA (see 50 C.F.R. §223.203 and §224.101) to date.[1]

On February 16, 2000, NMFS published a final rule designating critical habitat for 19 ESUs of West Coast salmon and steelhead (65 FR 7764). These designations were subsequently challenged in the D.C. District Court, and later vacated by court order on April 30, 2002 (National Ass'n of Homebuilders v. Evans, 2002 WL 1205743 No. 00-CV-2799 (D.D.C.). In 2003, the Pacific Coast Federation of Fishermen's Associations and five co-plaintiffs filed a complaint with the D.C. District Court alleging NMFS' failure to designate critical habitat in a timely manner. On September 12, 2003, the court approved an agreement resolving that litigation and establishing a schedule for designation of critical habitat. The schedule provided for submission to the Federal Register of the proposed rule(s) designating critical habitat for 19 ESUs for which critical habitat had been vacated in additional to critical habitat for the Northern California steelhead ESU which was listed in June 2000. On July 13, 2004, the D.C. District Court approved an amendment to the agreement which required critical habitat proposals for ESUs under the jurisdiction of the Southwest Region of NMFS to be published in the Federal Register by November 30, 2004.

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[1] As a result of a September 2001 U.S. District Court ruling (Alsea Valley Alliance v. Evans, 143 F. Supp. 2d 1154 [D. Ore. 2001]) that rejected how NMFS treats hatchery populations in its listing determinations, the agency is currently reviewing the ESA status of all listed ESUs, as well as a potential ESU petitioned for listing (Lower Columbia River [LCR] coho salmon) (see 67 FR 6215, February 11, 2002).

As part of this re-designation process NMFS' Southwest Region has completed the first phase of work associated with the critical habitat designation effort. This phase has involved the compilation and review of the best available scientific data to support the proposed critical habitat designations, including the mapping of occupied habitat, habitat use, and assessment of the conservation value of occupied habitat. The results of this and other assessments that are underway (e.g. an economic analysis, evaluation of DOD land and facility management plans, and discussions with Tribal governments) are being used by agency decision makers as potential exclusions are considered as part of the Section 4(b)(2) process and critical habitat designations are formulated. Following the completion of these assessments, the agency will develop critical habitat proposals and conduct formal rule making in accordance with the Court-ordered schedule.

For the reasons described above, the Southwest Region is currently reviewing information relevant to critical habitat designation proposals for two chinook salmon salmon and five *O. mykiss* ESUs in California, including: 1) California Coastal (CC) chinook, 2) Northern California (NC) *O. mykiss*, 3) Central California coast (CCC) *O. mykiss*, 4) South-Central California coast (SCCC) *O. mykiss*, 5) Southern California (SC) *O. mykiss*, 6) Central Valley (CV) spring run chinook, and 7) Central Valley (CV) *O. mykiss*. If new information warrants, the agency may later revise, subject to appropriate regulatory procedures, existing critical habitat designations for three other listed ESUs in California: 1) Sacramento River winter-run chinook, 2) Central California coast coho and 3) Southern Oregon/Northern California coast coho.

As described later, the Southwest Region established three CHART's that were charged with compiling and analyzing the best available data for these seven ESUs in order to develop maps of occupied habitat and habitat use, make findings regarding the presence of essential habitat features in each watershed, identify potential management actions that may affect those features, and to assess the conservation value of all occupied areas within current geographic range of each ESU.

II. CRITICAL HABITAT UNDER THE ESA

The ESA directs that critical habitat be designated for threatened or endangered species at the time of listing (unless it is not determinable at that time) or within 1 year of listing (unless the agency determines that it is not prudent to do so). Agency regulations at 50 CFR 424.12(a)(1) specify that a designation of critical habitat is not prudent when one or both of the following situations exist: (i) the species is threatened by taking or other human activity, and identification of critical habitat can be expected to increase the degree of such threat to the species, or (ii) such designation of critical habitat would not be beneficial to the species. NMFS has not found either of these circumstances to exist for any listed salmon or *O. mykiss* ESUs.

A. Definitions

The ESA defines critical habitat under section 3(5)(A) as follows:

> (i) the specific areas within the geographical area occupied by the species, at the time it is listed . . ., on which are found those physical or biological features (I) essential to the conservation of the species and (II) which may require special management considerations or protection; and
>
> (ii) specific areas outside the geographical area occupied by the species at the time it is listed . . . upon a determination by the Secretary that such areas are essential for the conservation of the species.

Once critical habitat is designated, ESA Section 7 requires federal agencies to ensure that they do not fund, authorize, or carry out any actions that will destroy or adversely modify that habitat. This requirement is in addition to the Section 7 requirement that federal agencies ensure that their actions do not jeopardize the continued existence of listed species.

A recent amendment to section 4(a) of the Act excludes military land from designation, where that land is covered by an Integrated Natural Resource Management Plan that the Secretary has found in writing will benefit the listed species.

ESA Section 4(b)(2) requires NMFS to designate critical habitat for threatened and endangered species "on the basis of the best scientific data available and after taking into consideration the economic impact, impact on national security, and any other relevant impact, of specifying any particular area as critical habitat." This section grants the Secretary [of Commerce] discretion to exclude any area from critical habitat if he determines "the benefits of such exclusion outweigh the benefits of specifying such areas as part of the critical habitat." The Secretary's discretion is limited, as he may not exclude areas if it "will result in the extinction of the species."

B. Salmonid Life History

Pacific salmon and steelhead (or *O. mykiss*) are anadromous fish, meaning adults migrate from the ocean to spawn in freshwater lakes and streams where their offspring hatch and rear prior to migrating back to the ocean to forage until maturity. The migration and spawning times vary considerably between and within species and populations (Groot and Margolis, 1991). At spawning, adults pair up to lay and fertilize thousands of eggs in freshwater gravel nests or "redds" excavated by females. Depending on lake/stream temperatures, eggs incubate for several weeks to months before hatching as "alevins" (a larval life stage dependent on food stored in a yolk sac). Following yolk sac absorption, alevins emerge from the gravel as young juveniles called "fry" and begin actively feeding. Depending on the species and location, juveniles may spend from a few hours to several years in freshwater areas before migrating to the ocean. The physiological and behavioral changes required for the transition to salt water result in a distinct "smolt" stage in most species. On their journey, juveniles must migrate downstream through every riverine and estuarine corridor between their natal lake or stream and the ocean. For example, smolts from Idaho will travel as far as 900 miles from their inland spawning grounds. En route to the ocean, the juveniles may spend from a few days to several weeks in the estuary, depending on the species. The highly productive estuarine environment is an important feeding and acclimation area for juveniles preparing to enter marine waters.

Juveniles and subadults typically spend from 1 to 5 years foraging over thousands of miles in the North Pacific Ocean before returning to spawn. Some species, such as coho and chinook salmon, have precocious life history types (primarily male fish) that mature and spawn after only several months in the ocean. Spawning migrations known as "runs" occur throughout the year, varying by species and location. Most adult fish return or "home" with great fidelity to spawn in their natal stream, although some do stray to non-natal streams. Salmon species die after spawning, while steelhead may return to the ocean and make repeat spawning migrations.

This complex life cycle gives rise to complex habitat needs, particularly during the freshwater phase (Spence et al. 1996). Spawning gravels must be a certain size and free of sediment to allow successful incubation of the eggs. Eggs also require cool, clean, and well-oxygenated waters for proper development. Juveniles need abundant food sources, including insects, crustaceans, and other small fish. They need places to hide from predators (mostly birds and bigger fish), such as under logs, root wads, and boulders in the stream, as well as beneath overhanging vegetation. They also need places to seek refuge from periodic high flows (side channels and off-channel areas) and from warm summer water temperatures (coldwater springs and deep pools). Returning adults generally do not feed in fresh water but instead rely on limited energy stores to migrate, mature, and spawn. Like juveniles, they also require cool water and places to rest and hide from predators. During all life stages, salmon and steelhead require cool water that is free of contaminants. They also need migratory corridors with adequate passage conditions (timing, water quality, and water quantity) to allow access to the various habitats required to complete their life cycle.

The homing fidelity of salmon and steelhead is reflected in the distribution of distinct, locally adapted populations among watersheds with differing environmental conditions and distinct habitat characteristics (Taylor 1991, Policansky and Magnuson 1998, McElhany et al. 2000). Spatially structured populations in which populations or subpopulations occupy habitat patches, connected by some low-to-moderate stray rates, are often generically referred to as "meta-populations" (Levins 1969). Low-to-moderate levels of straying result in regular genetic exchange among populations, creating genetic similarities among populations in adjacent watersheds (Quinn 1993, Utter et al. 1989, Ford 1998).

The overall health and likelihood of persistence of salmon and steelhead meta-populations are affected by the abundance, productivity, connectivity/spatial structure, and diversity of the component populations (see McElhaney et al. 2000). With respect to the habitat requirements of a healthy ESU, an ESU composed of many diverse populations distributed across a variety of well-connected habitats can better respond to environmental perturbations including catastrophic events (Schlosser and Angermeier 1995, Hanski and Gilpin 1997, Tilman and Lehman 1997, Cooper and Manger 1999). Additionally, well-connected habitats of different types are essential to the persistence of diverse, locally adapted salmonid meta-populations capable of exploiting a wide array of environments, as well as capable of responding to and surviving both short- and long-term environmental change (e.g., Groot and Margolis 1991, Wood 1995). Differences in local flow regime, temperature regime, geological, and ecoregion characteristics correlate strongly with ESU population structure (Ruckelshaus et al. 2001).

ESUs with fewer and less diverse habitat types and associated populations are more likely to become extinct due to catastrophic events. They also have a lower likelihood that the necessary phenotypic and genotypic diversity will exist to maintain future viability. ESUs with limited geographic range are similarly at increased extinction risk due to environmental variability and catastrophic events. ESUs with populations that are geographically distant from each other, or that are separated by severely degraded habitat, may lack the connectivity to function as meta-populations and are more likely to become extinct. ESUs with reduced local adaptation and limited life-history diversity are more likely to go extinct as the result of correlated environmental catastrophes or environmental change that occurs too rapidly for an evolutionary response. Assessing the conservation value of specific habitat areas to ESU viability involves evaluating the quantity and quality of habitat features (for example, spawning gravels, wood and water condition, side channels), the relationship of the area to other areas within the ESU, and the significance to the ESU of the population occupying that area.

C. Geographical Area Occupied by the ESU and Specific Areas within the Geographical Area

In NMFS' previous critical habitat designations, the agency concluded that the limited availability of species distribution data prevented mapping salmon and steelhead critical habitat at a scale finer than occupied river basins. While efforts were underway in some areas to address these data limitations, the agency noted that "most have yet to be completed or fail to depict salmon and steelhead habitats in a consistent manner or at a fine geographic scale"(65 FR 7764, February 16, 2000). Because of such data limitations, our February 2000 critical habitat designations indicated that the "geographical area occupied by the species (or ESU)" was best characterized by all accessible river reaches within the current range of the listed species.

In order to define "specific areas" within the geographical area occupied by the individual species (or ESUs), NMFS relied on the U.S. Geological Survey's (USGS) identification of subbasins. The subbasin boundaries are based on an area's topography and hydrography, and USGS has developed a uniform framework for mapping and cataloging drainage basins using a unique hydrologic unit code (HUC) identifier (Seaber et al. 1986). The HUCs contain separate two-digit identifier fields wherein HUC1 refers to a region comprising a relatively large drainage area (e.g., Region 17 for the entire Pacific Northwest), while subsequent fields identify smaller nested drainages. Under this convention, subbasins are commonly referred to as HUC4s. In the agency's 2000 critical habitat designations (as well as its designations for SONCC and Central California coast coho), therefore, NMFS identified as critical habitat all areas accessible to listed salmon or steelhead within specifically identified HUC4s for each ESU.

A major goal of this current effort to re-designate critical habitat for seven ESUs in California (as well as for 13 ESUs in the Pacific Northwest) was to improve our understanding of and more precisely identify those freshwater and estuarine areas that are occupied by the listed ESUs for which the designations are being developed. In the Pacific Northwest, Federal, state, and tribal fishery biologists have made substantial progress mapping species distribution at the level of stream reaches. The mapping includes areas where the species has been observed or where it is presumed to occur based on the professional judgment of biologists familiar with the watershed. Much of these data are accessible and can be analyzed using geographic information systems (GIS) to produce consistent and fine-scale maps. As a result of these efforts, nearly all salmonid freshwater and estuarine habitats in Washington, Oregon, and Idaho are now mapped and available in GIS at a scale of 1:24,000.

In California, however, similar mapping efforts have not been conducted by Federal, State or tribal co-managers on the scale that was needed, and therefore, ready made GIS data layers were generally not available for the ESUs in California Given the need to map occupied habitat more precisely and the lack of such information in California, the Southwest Region embarked on a major effort to compile available information and develop occupied habitat maps for all seven ESUs. In order to make this effort manageable, the data were compiled for stream hydrology at a scale of 1:100,000 rather than the 1:24,000 scale that was available for salmonid ESUs in the Pacific Northwest. Fishery biologists in the Southwest Region were organized into teams (i.e. CHARTs) to compile and organize information available from the literature, personal knowledge, and many instances Federal and state agencies regarding the distribution, habitat use, and habitat quality for each of the seven ESUs. This information has been organized into several databases and converted into GIS data layers for the analysis of data and generation of maps. As a result of this major effort, the Southwest Region has developed preliminary maps using standard GIS software which show the stream reaches occupied by each ESU. Additional information was compiled regarding the manner in which these occupied habitat reaches are thought to be used (e.g. spawning, rearing, migration). The CHARTs used these data for developing occupied watershed conservation assessments for all seven ESUs in California and we believe that this approach has enabled us to more accurately delineate the "geographical area occupied by the species" referred to in the ESA's definition of critical habitat.

In addition to more accurately defining areas that are occupied, NMFS also wanted to group the occupied stream reaches into finer scale "specific areas" than the HUC4s that were used in the 2000 critical habitat designations so that analysis of conservation value and economic impacts as part of the Section 4(b)(2) exclusion process could be accomplished on a finer scale. Since 2000, various federal agencies have identified HUC5 watersheds throughout the Pacific Northwest using the USGS mapping conventions referred to above. This information is now generally available from these agencies and via the internet (California Spatial Information Library 2004, Regional Ecosystem Office 2004). For ESUs in the Pacific Northwest, therefore, NMFS used these HUC5 watersheds to organize critical habitat information systematically and at a scale that was relevant to the spatial distribution of salmon and steelhead. Organizing information at this scale is especially relevant for salmonids since their innate homing ability allows them to return to particular reaches in the specific watersheds where they were born. Such site fidelity results in spatial aggregations of salmonid populations (and their constituent spawning stocks) that generally correspond to areas encompassed by HUC4s or HUC5s (Washington Department of Fisheries et al. 1992, Kostow 1995, McElhany et al. 2000). Aggregating stream reaches into HUC5 watersheds allowed the agency to refine its interpretation of the "specific areas" within or outside the geographical area occupied by the species, at a scale that corresponds well to salmonid population structure and ecological processes. In California, it was not possible to use the USGS HUC5 watershed framework to organize biological and other types of information since they have not been delineated for the entire geographic range occupied by the seven listed salmonid ESUs for which critical habitat proposals are being developed. As an alternative, the Southwest Region relied on the State of California's CALWATER classification system for watershed mapping of ESUs in California, and specifically used Hydrologic Subarea (HSA) units in that system as the "specific area" for aggregating biological information and making conservation assessments.

D. Unoccupied Areas

ESA Section 3(5)(A)(ii) defines critical habitat to include "specific areas outside the geographical area occupied" if the areas are "essential for the conservation of the species." NMFS regulations at 50 CFR 424.12(e) emphasize that the agency "shall designate as critical habitat areas outside the geographical area presently occupied by a species only when a designation limited to its present range would be inadequate to ensure the conservation of the species." The agency focused its attention on the species' historical range when considering unoccupied areas since these logically would have been adequate to support the evolution and long-term maintenance of evolutionarily significant units. Although it was not their primary focus, the CHARTs were also asked to identify and make recommendations about whether unoccupied stream habitat (either habitat within specific HSAs that were otherwise partially occupied or HSAs that were entirely unoccupied) may be essential for conservation of individual ESUs.

E. Marine Areas

The Southwest Region did not consider marine areas as part of the designations for ESUs in California.

F. Lateral Extent

In past designations NMFS described the lateral extent of critical habitat in various ways ranging from fixed distances to "functional" zones defined by important riparian functions (65 FR 7764, February 16, 2000). Both approaches presented difficulties, and this was highlighted in several comments (most of which requested that we focus on aquatic areas only) received in response to the ANPR (68 FR 55926; September 29, 2003). Designating a set riparian zone width will (in some places) accurately reflect the distance from the stream on which PCEs might be found, but in other cases may over- or understate the distance. Designating a functional buffer avoids that problem, but makes it difficult for Federal agencies to know in advance what areas are critical habitat. To address these issues we are considering the option of defining the lateral extent of designated critical habitat as the width of the stream channel defined by its bankfull elevation. Bankfull elevation is the level at which water begins to leave the channel and move into the flood plain (Rosgen, 1996) and is reached at a discharge which generally has a recurrence interval of 1 to 2 years on the annual flood series (Leopold et al., 1992). Such an interval is commensurate with nearly all of the juvenile freshwater life phases of most salmon and *O. mykiss* ESUs. Therefore, it is reasonable to assert that this lateral extent is regularly "occupied" with a high degree of certainty. Moreover, the bankfull elevation can be readily discerned for a variety of stream reaches and stream types using recognizable water lines (e.g., marks on rocks) or vegetation boundaries (Rosgen, 1996). If bankfull elevation is not evident on either bank, the ordinary high-water line (as defined by the U.S. Army Corps of Engineers (Corps) in 33 CFR 329.11) could be be used to determine the lateral extent of critical habitat.

As we have underscored in previous critical habitat designations, however, Federal agencies must still be aware that the quality of aquatic habitat within stream channels is intrinsically related to the adjacent riparian zones and floodplain, to surrounding wetlands and uplands, and to non-fish-bearing streams above occupied stream reaches. Human activities that occur outside the stream can modify or destroy physical and biological features of the stream. In addition, human activities that occur within and adjacent to reaches upstream (e.g., road failures) or downstream (e.g., dams) of designated stream reaches can also have demonstrable effects on physical and biological features of designated reaches.

In estuarine areas we believe that extreme high water is the best descriptor of lateral extent. As noted above for stream habitat areas, human activities that occur outside the area inundated by ordinary or extreme high water can modify or destroy physical and biological features of the nearshore habitat areas and Federal agencies must be aware of these important habitat linkages as well.

G. Physical or Biological Features Essential to the Conservation of the Species (Primary Constituent Elements)

Agency regulations interpret the statutory phrase "physical or biological features essential to the conservation of the species." The regulations state that these features include, but are not limited to, space for individual and population growth and for normal behavior; food, water, air, light, minerals, or other nutritional or physiological requirements; cover or shelter; sites for breeding, reproduction, and rearing of offspring; and habitats that are protected from disturbance or are representative of the historical geographical and ecological distribution of a species. The regulations further direct the agency to "focus on the principal biological or physical constituent elements . . . that are essential to the conservation of the species, and specify that these elements shall be the "known primary constituent elements." The regulations identify primary constituent elements (PCE) as including, but not being limited to: "roost sites, nesting grounds, spawning sites, feeding sites, seasonal wetland or dryland, water quality or quantity, host species or plant pollinator, geological formation, vegetation type, tide, and specific soil types."

NMFS developed a list of PCEs specific to salmon and steelhead and relevant to determining whether occupied stream reaches within a HUC5 or HSA fit the definition of "critical habitat." The ESUs share many of the same life history characteristics and therefore many of the same PCEs. These PCEs include sites essential to support one or more life stages of the ESU (i.e. sites for spawning, rearing, migration and foraging). These sites in turn contain physical or biological features essential to the conservation of the ESU (for example, spawning gravels, water quality and quantity, side channels, forage species). Specific types of sites and the features associated with them include the following:

1. **Freshwater spawning sites** with sufficient water quantity and quality and adequate substrate to support spawning, incubation and larval development
2. **Freshwater rearing sites** with sufficient water quantity and floodplain connectivity to form and maintain physical habitat conditions and allow salmonid development and mobility; sufficient water quality to support growth and development; food and nutrient resources such as terrestrial and aquatic invertebrates and forage fish; and natural cover such as shade, submerged and overhanging large wood, log jams, beaver dams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks
3. **Freshwater migration corridors** free of obstruction and excessive predation with adequate water quantity to allow for juvenile and adult mobility; cover, shelter, and holding areas for juveniles and adults; and adequate water quality to allow for survival
4. **Estuarine areas** that provide uncontaminated water and substrates; food and nutrient sources to support growth and development; and connected shallow water areas and wetlands to cover and shelter juveniles
5. **Marine areas** with sufficient water quality to support salmonid growth, development, and mobility; food and nutrient resources such as marine invertebrates and forage fish;

and nearshore marine habitats with adequate depth, cover, and marine vegetation to provide cover and shelter

H. Special Management Considerations or Protection

NMFS ESA regulations at 424.10(j) define "special management considerations or protection" to mean "any methods or procedures useful in protecting physical and biological features of the environment for the conservation of listed species." Based on discussions with NMFS biologists the agency identified a number of management activities that may affect the PCEs. Spence et al. (1996) also contains a comprehensive review of factors limiting salmonid growth and production and relates them to specific human activities and useful management practices/actions. Major categories of habitat-related activities, identified in this report and by agency biologists, include: (1) forestry (2) rangeland management including grazing, (3) water withdrawals for agriculture and other purposes, (4) road building/maintenance, (5) channel modifications/diking, (6) urbanization, (7) sand and gravel mining, (8) mineral mining, (9) water diversions for hydroelectric dams, (10) irrigation impoundments and withdrawals, (11) wetland loss/removal, (12) flood control and streambank stabilization activities, and (14) exotic/invasive species introductions and management. In addition to these, the harvest of salmonid prey species (e.g., herring, anchovy, and sardines) may present another potential habitat-related management activity (PFMC 1999). All of these activities have PCE-related impacts via their alteration of one or more of the following: stream hydrology, flow and water-level modifications, fish passage, geomorphology and sediment transport, temperature, dissolved oxygen, vegetation, soils, nutrients and chemicals, physical habitat structure, and stream/estuarine/marine biota and forage (Spence et al. 1996; PFMC 1999).

III. Critical Habitat Analytical Review Teams (CHARTs)

To develop information essential for the re-designation of critical habitat for the 7 ESUs in California, the Southwest Region formed several CHART teams (CHARTs) comprised of agency fishery biologists. The CHARTs compiled all available information regarding the distribution and habitat use for the 7 ESUs, worked with the GIS specialists to develop maps depicting the spatial distribution of each ESU overlaid on stream hydrography at a scale of 1:100,000, verified that PCE's occurred in each occupied HSA, verified the existence of management activities that may affect the PCEs, and lastly performed conservation assessments for all occupied watersheds, including riverine reaches and estuarine areas within each ESU.

The CHARTs have completed three phases of the work associated with critical habitat designations. In the first phase, each CHART identified, compiled, and organized the best scientific information available regarding the distribution of the fish and the habitats that support them for each ESU in their geographic area. This phase also involved reviewing and refining as needed a CHART scoring system for the systematic discussion and evaluation of PCEs and for contributing to the determination of the overall conservation value of particular watersheds and areas. After collecting and synthesizing the available data for each ESU, as well as reviewing available GIS mapping products and statistical information, the CHARTs met to review and discuss the information. In this phase the CHARTs verified the presence of the PCEs in each occupied HSA, identified management activities that may affect those PCEs, and collectively scored each occupied watershed/area using the system developed in the first phase. Finally, the CHARTs reviewed the scores previously derived and then considered additional information about the relationship of each HSA to one another in the ESU in order to assign high, medium, and low conservation value ratings to each HSA occupied by each ESU. Details and key considerations involved in each phase are discussed below

A. CHART Phase 1.

In Phase 1, the CHARTs were provided an orientation to the statutory and regulatory aspects of ESA critical habitat and discussed ways to identify, compile and organize the best available scientific data relevant to assessing potential critical habitat for each ESU. Over a period of several months, the CHART biologists identified and compiled all the available information and worked closed with GIS staff to develop databases and associated GIS products that would be used in the eventual scoring and conservation rating of occupied watershed units. CHART biologists also were oriented to a multi-factor scoring system that provided a consistent framework within which the teams could process information that would ultimately inform its conservation value rating of each watershed or area, and also provided an opportunity to modify the system as necessary to fit the available information for the ESUs they were addressing. The basis for using this factor-based scoring system was threefold. First it allowed CHART members with varied levels of experience in a particular geographic area to share and discuss their knowledge of specific places and biological/physical features using a consistent set of relevant factors for each watershed in the range of an ESU. Second it generated quantitative results (i.e., sums of factor scores) that displayed numerical variation between watersheds/areas that facilitated the ultimate CHART rating of each watershed's conservation value. Third, it provided a generally uniform and systematic way to assess the overall conservation value of component watersheds and areas for each ESU under consideration. The scoring system used by the CHARTs is shown in Table 1.

B. CHART Phase 2

In Phase 2, each CHART met to review and discuss the information compiled and organized in Phase 1. Subsequently, they proceeded to (1) verify the presence of PCEs in each HSA (i.e. spawning, rearing and/or migration habitat), (2) identify management actions that may affect the PCEs, and (3) apply the framework scoring system. For each watershed, the CHART members assessed the best available fish distribution data and noted any discrepancies with their own knowledge of the area (which included documented sources of information). If discrepancies were found, they were flagged for follow-up and resolution with the appropriate state fishery agency. The CHARTs then confirmed whether the occupied reaches/areas were likely to contain one or more of the specified PCEs. To aid in these assessments, the teams were provided with GIS data and maps displaying a variety of data layers including fish and PCE distributions, ESU population boundaries, stream hydrography, land use, land cover, and land ownership. The CHARTs were also asked to determine whether the PCEs in a particular HSA could be affected by human actions and whether such actions are actually occurring in that HSA (based on their experience in ESA section 7 consultations).

C. CHART Phase 3

In Phase 3, the CHARTs met to discuss the watershed scores generated in Phase 2, along with additional considerations, with the objective of assigning a high, medium, or low conservation value[2] to each watershed unit/HSA (the conservation value of a given HSA is the relative importance of the HSA to conservation of the ESU). The additional considerations included the relationship of each HSA to other HSAs in the ESU and the significance to the ESU of the population occupying each HSA. As an example of the first additional consideration, an HSA with a particular raw score might receive a medium rating if it is in close proximity to several other high-scoring HSAs that support the ESU, while another HSA with that same raw score might receive a high rating if it is one of only a few HSAs supporting an ESU, or if the other HSAs have low scores. As another example of the first consideration, connectivity of habitats is an important consideration for anadromous salmonids, which require access to the ocean as well as to a network of connected spawning habitats. Thus an HSA that contains a rearing and migration corridor for fish from a high-valued spawning area might receive a high rating even though it has a

[2] In the Advance Notice of Proposed Rulemaking (68 FR 55926, September 29, 2003) we describe the conservation value of a site as depending on "(1) the importance of the populations associated with a site to the ESU conservation, and (2) the contribution of that site to the conservation of the population either through demonstrated or potential productivity of the area."

medium score.[3] The second consideration involves population characteristics and is relevant because some populations have a higher conservation value to the ESU than others. Thus a HSA that received a medium score might nevertheless be rated high if it supports a unique or significant population within the ESU. In other words, the scores provided a judgment about the value of each HSA in isolation, while the additional considerations allowed the CHARTs to evaluate the relative contribution of each HSA and come up with an overall rating.

Based on the raw scores and the additional considerations, high-value watersheds/HSAs were those deemed to have a high likelihood of promoting ESU conservation, while low-value watersheds/HSAss were expected to contribute to conservation in only a minor way. The watershed scoring system proved to be a useful tool for informing the rating of conservation value; in general, those watersheds and areas that received the highest scores in Phase 2 also were deemed to have a high conservation value for the ESU, while the opposite was true for low-scoring watersheds and areas.

The final step in Phase 3 involved asking the CHARTs to identify any unoccupied areas that may be essential for the conservation of an ESU. Section 3(5)(C) of the ESA allows the agency to designate unoccupied areas, but only upon making a finding that "such areas are essential for the conservation of the species." Regulations at 50 CFR 424.12(e) state that the agency "shall designate as critical habitat areas outside the geographical area presently occupied by a species only when a designation limited to its present range would be inadequate to ensure the conservation of the species." The CHARTs were asked to provide their professional judgment as to whether limiting the designation to the entire occupied range would be adequate to ensure the conservation of the ESU. It was not possible for the CHARTs to determine conclusively that particular unoccupied areas "are" essential for the conservation of an ESU because such a determination would require a more comprehensive assessment than was possible at this point in the recovery planning process. The CHARTs were, however, able to identify those areas that <u>may</u> be essential for conservation for several ESUs. In making this assessment, the CHARTs used information regarding the ESU's historic distribution, as well as pertinent information from Section 7 consultations and developing recovery plans. The types of HSAs considered included those that are entirely blocked (e.g., areas above impassable dams). They also

[3] The CHARTs discussed this concept at length and were unanimous in concluding that this was a logical assertion to make for anadromous salmon and steelhead. Moreover, it helped resolve a recurring issue for some ESUs with HUC5s having relatively low or limited value tributary spawning habitats but which had primary importance as a rearing/migration corridor for fish/habitats upstream. In this case, the HUC5 could be assigned a lower overall conservation value, but could still contain a rearing/migration corridor with a higher conservation value.

included HSAs with some occupied stream reaches, as well as other reaches that were historically occupied, but that have been rendered inaccessible due to manmade obstructions.

IV. Preliminary Findings of CHARTs

Descriptions of each of the preliminary findings for each of the 7 ESU are attached as a series of Appendices to this report. Each appendix contains a general description of each ESU organized by the watershed units that were assessed and includes information on areas of occupancy, habitat use, PCEs, special management considerations, conservation scores and ratings, and a series of maps illustrating the spatial distribution of fish within each HSA.

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Table 1. Factors and Associated Criteria Considered by CHARTs to Determine the Conservation Value of Occupied HUC5s

Factors	Criteria
Factor 1. PCE Quantity Considers the total stream area or number of reaches in the HUC5 where PCEs are found and compares them relative to other HUC5s and their probable historical quantity in the HUC5.	3 = High number of stream reaches with PCEs in the HUC5. 2 = Moderate number of stream reaches with PCEs in the HUC5, near or reduced from historic levels. 1 = Low number of stream reaches with PCEs are in the HUC5, likely reduced from historic potential. 0 = Low number of stream reaches with PCEs are in the HUC5, likely near historic potential.
Factor 2. PCE Quality – Current Condition Considers the existing condition of the quality of PCEs in the HUC5.	3 = PCEs in the HUC5 are in good to excellent condition. 2 = PCEs in the HUC5 are in fair to good condition. 1 = PCEs in the HUC5 are in fair to poor condition. 0 = PCEs in the HUC5 are in poor condition.
Factor 3. PCE Quality – Potential Condition Considers the likelihood of achieving PCE potential in the HUC5, either naturally or through active conservation/restoration, given known limiting factors, likely biophysical responses, and feasibility.	3 = PCEs in the HUC5 are highly functioning and are at their historic potential. 2 = PCEs in the HUC5 are reduced, but have high improvement potential. 1 = PCEs in the HUC5 may have some improvement potential. 0 = PCEs in the HUC5 have little or no improvement potential.
Factor 4. PCE Quality – Support of Rarity/Importance Considers the PCE support of rare genetic or life history characteristics or rare/important habitat types in the HUC5	3 = Highly likely that PCEs in the HUC5 support a rare genetic or life history type or include a rare/important habitat type (e.g., seeps, coldwater refuges, side channels, lakes). 2 = Possible that PCEs in the HUC5 support a rare genetic or life history type or include a rare/important habitat type. 1 = Unknown whether PCEs in the HUC5 support a rare genetic or life history type or include a rare/important habitat type. 0 = Unlikely that PCEs in the HUC5 probablysupport a rare genetic or life history type or include a rare/important type.
Factor 5. PCE Quality – Support of Abundant Populations Considers the PCE support of variable-sized populations relative to other HUC5s and the probable historical levels in the HUC5	3 = PCEs in the HUC5 currently support a large population. 2 = PCEs in the HUC5 historically supported a large population that is currently small. 1 = PCEs in the HUC5 currently and/or historically supported a small population. 0 = PCEs in the HUC5 support a population whose abundance is unknown or it is unlikely that it is or was significant.
Factor 6. PCE Quality – Support of Spawning/Rearing Considers the PCE support of spawning or rearing of varying numbers of populations.	3 = PCEs in the HUC5 support (currently or historically) spawning or rearing of multiple populations or life history types, or support the only extant spawning habitat for a single population. 2 = PCEs in the HUC5 related to spawning or rearing are found in two or more HUC5s that support a single population. 1 = Uncertain but possible that the PCEs in the HUC5 support spawning or rearing for at least one population. 0 =Unlikely that there are PCEs in the HUC5 that support spawning/rearing for at least one population.